20034

EPA REGION V ARCS PROGRAM

Donohue ENGINEERS ARCHITECTS SCIENTISTS

FINAL

ADDENDUM I
PHASE II WORK PLAN

HIMCO DUMP
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
ELKHART, INDIANA

JULY 1991

U.S. EPA Contract 68-W8-0093

Donohue & Associates, Inc.

EPA Contract No.: 68-W8-0093
Work Assignment No.: 17-5L4J
Donohue Project No.: 20026.001

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HIMCO DUMP
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JULY 1991

Prepared for:

U.S. Environmental Protection Agency
Emergency and Remedial Response Branch
Region V
230 South Dearborn Street
Chicago, Illinois 60604

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REMEDIAL INVESTIGATION/FEASIBILITY STUDY
ELKHART, INDIANA

JULY 1991

Prepared by: Vanessa Harris — 18 July '91
Vanessa Harris — Date
Site Manager
Donohue & Associates, Inc.

Approved by: Roman M. Gau (TGD) — July 18, 1991
Roman M. Gau, P.E. — Date
Project Manager
Donohue & Associates, Inc.

Michael L. Crosser/dms — 18 July 1991
Michael L. Crosser — Date
Technical Services/Quality Assurance Manager
Donohue & Associates, Inc.

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EXECUTIVE SUMMARY

Donohue & Associates, Inc. (Donohue) is submitting Addendum I to the Himco Dump RI/FS Work Plan to the U.S. Environmental Protection Agency (EPA) to conduct a Phase II Remedial Investigation (RI) for the Himco Dump Superfund Site in response to Work Assignment No. 17-5L4J under Region V ARCS Contract No. 68-W8-0093.

This addendum is intended to supplement the approved Final Work Plan (Donohue, 1990) and only includes sections requiring modification or additional information.

The primary objectives of the additional work addressed in Addendum I to the Final Work Plan are to provide additional information regarding groundwater, soil, surface water and sediment that were not addressed during Phase I activities. The addendum will also address data needs for leachate, wetlands and the impact of dust. A Phase II RI will be implemented by evaluating existing data and conducting a multi-phased field investigation for the existing data needs. The purpose of the Phase II RI is to address data needs relevant to completing a baseline risk assessment and evaluating remedial alternatives. The scope of work will include:

- using existing groundwater data for private wells east of landfill
- performing a well inventory for wells east and south of the site
- collecting soil samples in the barren area south and east of the quarry
- modeling dust impacts
- conducting official wetlands delineation of area south of the quarry
- collecting soil samples in designated quarry wetland area
- collecting surface water and sediment samples in center of all three ponds; maximum of 3 per pond
- collecting background surface water/sediment sample
- collecting fish sampling for bioaccumulation studies
- geotechnical samples for consolidation and triaxial
- collecting leachate samples
- delineating extent of PNA debris area
- installing one additional monitoring well on the southern boundary of the site
- collecting additional groundwater samples from all monitoring wells installed during the Phase I field investigation and selected USGS wells

1.0 INTRODUCTION

Donohue & Associates, Inc. (Donohue) is submitting Addendum I to the Final Himco Dump RI/FS Work Plan to the U.S. Environmental Protection Agency (EPA) to conduct a Phase II Remedial Investigation (RI) for the Himco Dump Superfund Site in response to Work Assignment No. 14-5LJ4 under Region V ARCS Contract No. 68-W8-0093.

This addendum is intended to supplement the approved Final Work Plan (Donohue, 1990) and includes only those sections requiring modification or additional information. This addendum includes Section 3.5 Data Evaluation, Section 4.2.4 Rationale for Phase II RI and Appendix D-1 Schedule of Activities.

Before completing this Work Plan, Donohue conducted the following activities:

1. Completed field investigations during the Phase I RI including:

    - Site survey and topographic mapping
    - Electromagnetic survey for fill boundary determination
    - Magnetic survey to identify presence of buried drums
    - Excavation of test pits
    - Determination of presence/absence of wetlands
    - Suspected wetland soil sampling and analysis
    - Monitoring well installation, sampling, and analysis
    - Soil boring sampling and analysis
    - Existing monitoring well sampling and analysis
    - Private well sampling and analysis
    - Landfill waste sampling and geotechnical analysis
    - Landfill cap surface soil sampling and analysis
    - Landfill waste mass gas sampling and analysis
    - Residential gas sampling
    - Sediment and surface water sampling and analysis
    - Installation of staff gauges

2. Wrote Technical Memoranda describing Phase I RI field activities

3. Completed pre-Phase II work plan scoping meetings with representatives from the USEPA and Indiana Department of Environmental Management (IDEM).

The purpose of the Phase II RI is to address data needs, relevant to completion of baseline and environmental risk assessments and evaluation of remedial alternatives. The scope of work will include:

- using existing groundwater data for private wells east of landfill
- performing a well inventory for wells east of site
- collecting soil samples in the barren area south and east of quarry
- modeling dust impacts
- conducting official wetlands delineation of area south of quarry

- collecting soil samples in designated quarry wetland area
- collecting surface water and sediment samples in center of all three ponds; maximum of 3 per pond
- collecting background surface water/sediment sample
- collecting fish sampling for bioaccumulation studies
- geotechnical samples for consolidation and triaxial (five samples)
- collecting leachate samples
- delineating extent of PNA debris area
- installing one additional monitoring well on the southern boundary of the site
- collecting additional groundwater samples from all monitoring wells installed during the Phase I field investigation and selected USGS wells

2.0 SITE BACKGROUND AND SETTING

The site background and setting are described in detail in the Himco Dump RI/FS Final Work Plan (Donohue, 1990). Please refer to Section 2 of the previously approved work plan.

3.0 INITIAL EVALUATION

Section 3.5 provides additional information based on the Phase I field investigation. The plan sheet (Figure 3-2) identifying sample locations and surface drainage information is also provided.

3.5 PHASE I DATA EVALUATION

This section presents an assessment of the nature and extent of soil, surface water, sediment, groundwater, and soil gas contamination at the Himco Dump site and neighboring residential and commercial properties. It does not include a discussion of tentatively identified compounds, with the exception of phenobarbital and ethyl ether. Tentatively identified compounds will be addressed upon completion of the Risk Assessment.

3.5.1 Overview of Sampling Activities

3.5.1.1 Soil Sampling

Surface and subsurface soil samples were collected in accordance with the Final Field Sampling Plan, Himco Dump Remedial Investigation/Feasibility Study, Elkhart, Indiana (Donohue, 1990), Samples were collected from the landfill cap, three suspected wetland areas and four geotech borings. The samples were analyzed for the Target Analyte List (TAL) metals and cyanide, and the Target Compound List (TCL) Volatile Organic Compounds (VOC), Acid Base Neutrals (BNA), Polychlorinated Biphenyls (PCB) and pesticides as defined by the Contract Laboratory Program (CLP) to: 1) characterize the composition of the white powder matrix which composes the majority of the landfill cap material; 2) investigate possible soil contamination associated with the suspected wetland areas and 3) conduct geotechnical analysis. Water Quality data was also collected for groundwater, surface water and residential wells in order to evaluate remedial action alternatives during the feasibility study.

Soil sampling activities included collecting surface, subsurface and suspected wetland soil samples. A total of twelve soil samples were collected from depths as shallow as 3 to 9 inches and as deep as 8 to 16 inches from the landfill cap soil. In addition, approximately 17 shelby tube samples were collected from beneath the existing topsoil cover. Sixteen soil samples were collected for chemical analysis from three suspected wetland areas at the Himco Dump site. This included six from the Northwest wetland area, four from the wetland remnant, and six from the Gravel Pit wetland area. These areas included suspected wetland areas receiving drainage from the landfill cover as determined by aerial photographs and field observations and areas of apparent stressed vegetation. Soil samples were composited at each location from 0 to 18 inches or less where the auger met refusal.

3.5.1.2 Surface Water and Sediment Sampling

Surface water samples were collected from four locations at each of the three ponds located at the Himco Dump Site. Sediment samples were collected from the same locations after the surface water samples had been collected, at approximately 2 to 3 feet offshore at water depths ranging from 0 to 2 feet.

3.5.1.3 Groundwater and Residential Well Sampling

Groundwater samples were collected from 23 existing wells installed by the USGS in 1980 and 10 wells installed by Donohue & Associates in 1990 to investigate the horizontal and vertical extent of contamination. In addition, groundwater samples were collected from five residential wells immediately south of the Himco Dump site along County Road 10, and one residential well immediately south of County Road 10. Sampling of residential wells included sampling of the original shallow wells and the deeper wells installed in 1974. A total of eight residential well samples were collected.

3.5.1.4 Landfill Gas Screening

Four basements of residences located along County Road 10 were screened for the presence of methane and hydrogen sulfide gases.

3.5.1.5 Waste Mass Gas Sampling

A waste mass gas survey was conducted from existing landfill cap soil sampling locations to assess the extent and degree of TCL and selected tentatively identified compound contamination. Twelve cap soil sampling locations were selected for waste mass gas collection, based on the highest field VOC reading for each location. Samples were analyzed for the EPA TCL volatile organics and up to 10 tentatively identified volatile organic compounds.

3.5.2 Soil Sample Results

3.5.2.1 Surface Soil

Volatile organics detected in surface soil include acetone, methylene chloride, 1,1-dichloroethane, and toluene. The concentrations detected were relatively small for these volatiles and were not characteristic of all sampling locations as indicated by Tables 3-2 and 3-3. Of the 12 surface soil samples collected volatiles were detected at 30% or less of these samples for any single compound. Of the volatiles detected, acetone was detected at the highest concentration of 130 ug/kg at sample location GS-05. The detection of volatile organics in surface soil is random throughout the site and there appears to be no trends or hot spots for volatile organics in surface soil. In addition, the source of the volatile organics can not be determined from the data alone.

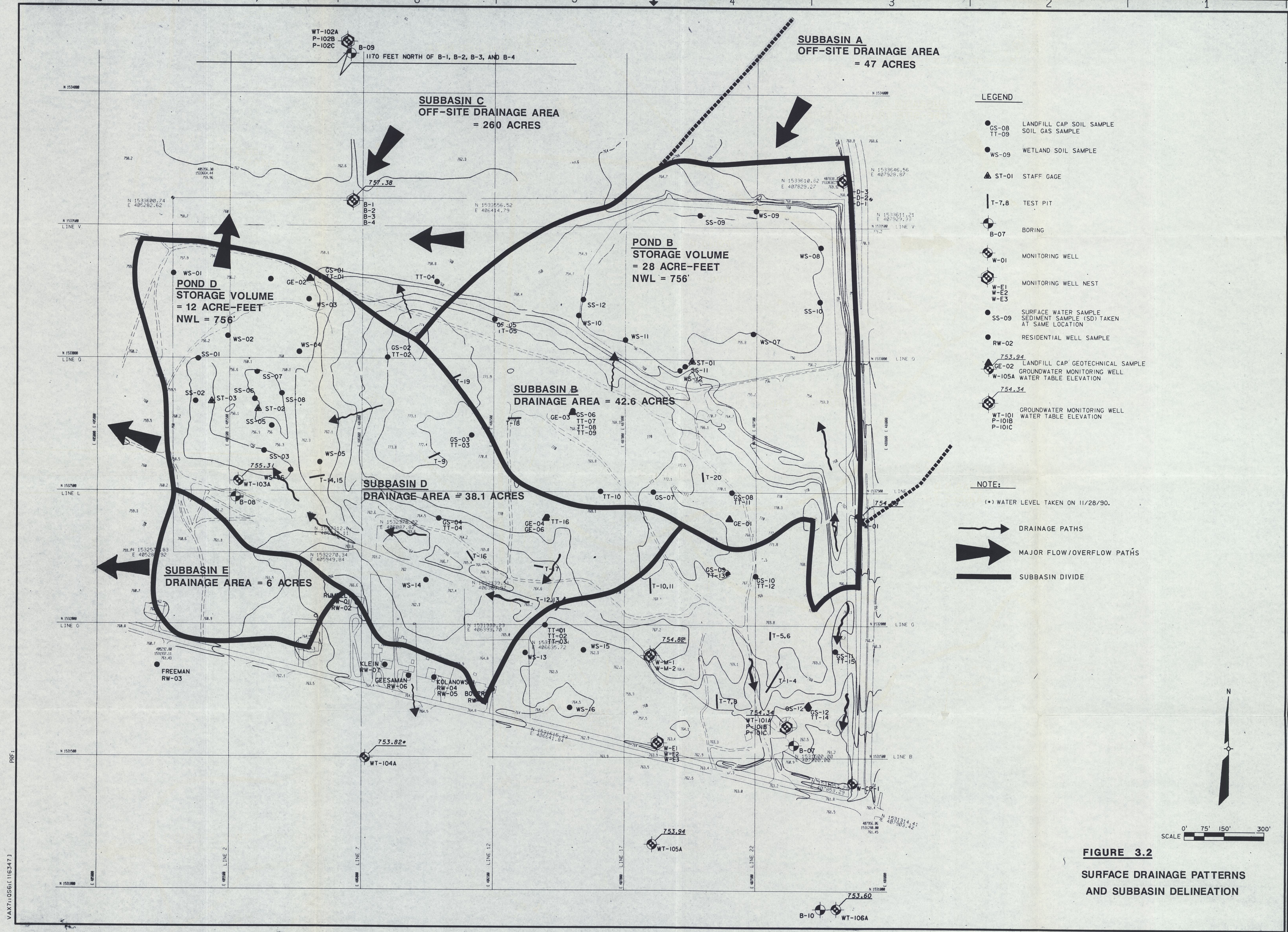

FIGURE 3.2

SURFACE DRAINAGE PATTERNS AND SUBBASIN DELINEATION

Scale	AS SHOWN
Date	MAY 1991
Designer	TJP
Drafter	DLJ
Checker	JEU
Approver	

No.	Revisions	By	Date

Donohue ENGINEERS ARCHITECTS SCIENTISTS

HIMCO DUMP SUPERFUND SITE

ELKHART, INDIANA

Sheet No.

Off. Loc. File No.

Project No.

Drawing No. ©

TABLE 3-2

SUMMARY OF RANGES OF VOLATILE ORGANIC COMPOUNDS OF POTENTIAL CONCERN
DETECTED IN SAMPLED MEDIA

HIMCO DUMP SITE
ELKHART, INDIANA
1990

	RANGES OF CONCENTRATIONS							
Compound	Surface Soil ug/kg	Suspected Wetland Soil ug/kg	Subsurface Soil ug/kg	Groundwater ug/l	Residential ug/l	Surface Water ug/l	Sediment ug/kg	Soil Gas ug/l
Acetone	15-130	37-140	9-950	2-270	7-22	ND	21-49	5-26
Benzene	ND	ND	ND	0.9-3	5	ND	ND	1-140
Bromodichloromethane	ND	ND	ND	0.7-6	ND	ND	ND	ND
2-Butanone	ND	2-8	ND	ND	ND	ND	ND	ND
Carbon Disulfide	ND	0.8	4-30	1	ND	4	ND	2-300
Chlorobenzene	ND	ND	ND	0.9	ND	ND	ND	ND
Chloroethane	ND	ND	ND	2-12	0.6	ND	ND	ND
Chloroform	ND	ND	ND	1-4	ND	ND	0.7	ND
Chloromethane	ND	ND	ND	ND	ND	ND	ND	9-1,100
Dibromochloromethane	ND	ND	ND	1-5	ND	ND	ND	ND
1,1-Dichloroethane	5	ND	4-13	3	8	ND	ND	60-86
1,2-Dichloroethane (total)	ND	ND	1	5-6	ND	ND	ND	2-1,300
Ethyl Benzene	ND	0.7-2	ND	ND	ND	1-2	ND	2-700
2-Hexanone	ND	ND	ND	0.7-1	ND	ND	ND	ND
4-Methyl-2-pentanone	ND	ND	ND	1	ND	3	ND	ND
Methylene Chloride	3-4	ND	3-55	1-19	2-73	6-120	2	1-80
Styrene	ND	0.8	ND	ND	ND	ND	ND	3-10
Tetrachloroethane	ND	ND	ND	0.6	ND	ND	1	1-1,400
Toluene	2-5	10-31	2-43	0.6	0.6	ND	ND	3-600
Trichloroethane	ND	0.9	ND	0.6-42	ND	ND	1	4-370
1,1,1-Trichloroethane	ND	ND	2-3	0.8-8	0.9	ND	ND	2-300
Vinyl Chloride	ND	ND	ND	ND	ND	ND	ND	4-8,600
Xylene (total)	ND	0.7-5*	ND	ND	ND	0.9-6	1	2-1,300

* Field duplicate for this media detected xylene at a concentration of 6 ug/kg

ND - None Detected

A/P/HIMCO/AI6

TABLE 3-3

FREQUENCY OF VOLATILE ORGANIC COMPOUNDS OF POTENTIAL CONCERN
DETECTED IN SAMPLED MEDIA

HIMCO DUMP SITE
ELKHART, INDIANA
1990

	RANGES OF CONCENTRATIONS							
Compound	Surface Soil	Suspected Wetland Soil	Subsurface Soil	Groundwater	Residential	Surface Water	Sediment	Soil Gas
Acetone	3	2	17	6	4		2	4
Benzene				2	1			14
Bromodichloromethane				4				
2-Butanone		4						
Carbon Disulfide		1*	2	1		2		12
Chlorobenzene				1				
Chloroethane				2	1			
Chloroform				4			1	
Chloromethane								5**
Dibromochloromethane				2				
1,1-Dichloroethane	1		6	1	2			4
1,2-Dichloroethane (total)			1	3				3
Ethyl Benzene		2				4		4
2-Hexanone				3				
4-Methyl-2-pentanone				1		1		
Methylene Chloride	2		7	11	8	3	1	12
Styrene		1						
Tetrachloroethane				1			1	4
Toluene	3	2	17	1	1			13
Trichloroethane		1		4			1	6
1,1,1-Trichloroethane			2	3	1		1	8***
Vinyl Chloride								3
Xylene (total)		4				6	1	4
Total Number of Samples Collected	12	16	30	68	8	12	12	16

* detected in field duplicate only
** also detected in field duplicate taken at a different sampling location (TT16)
*** detected in field duplicate, but not in sample from same location (TT16)

Semivolatile organics detected in surface soil included benzoic acid, bis(2-ethylhexyl)phthalate, di-n-butylphthalate, and dichlorobenzene. The ranges of concentrations and frequency detected are provided in Table 3-4 and Table 3-5. The frequency of detection of semivolatile organics is typically 16% or less, however, bis(2-ethylhexyl)phthalate was detected in 83% of the samples locations. The source of the semivolatiles is unknown and the distribution appears to be random.

Inorganics detected in surface soil are summarized in Table 3-6. The frequency of detection is provided in Table 3-7. Fifteen different inorganics were detected in surface soil. Of these, seven were detected at concentrations less than 5 mg/kg. The next range of concentrations were those compounds detected at less than 100 mg/kg and includes antimony (7.7-46.8 mg/kg), copper (1.9-19.3 mg/kg), manganese (1.3-11.9 mg/kg) and sodium (31.4-77.8 mg/kg). Aluminum was detected at concentrations ranging from 9-266 mg/kg, which is as much 25 times less than the range of concentrations detected in other soils. Iron, detected at concentrations of 9.8 to 298 mg/kg, was as much as 33 times less than the range of concentrations detected in other soils. Significant differences in the range of concentrations for magnesium can also be noted among the different soil media. Cadmium and silver were detected in surface soil and groundwater. The single largest reported concentration for inorganics in any media was that of calcium ranging from 226,000 to 321,000 mg/kg in surface soil. In the surface soil samples this indicates that the composition of the landfill cap is calcium sulfate.

Surface soil concentrations (which include suspected wetland soil samples) were compared to typical ranges of concentrations of native soils, as defined by Dragun, to determine if there we any exceedances. Tables 3-8 and 3-10 summarize this comparison. All exceedances of typical ranges were found in suspected wetland soils samples.

3.5.2.2 Subsurface Soil

Volatiles detected in subsurface soil samples are provided in Table 3-2. Acetone was detected at sample location GT-06 at depths of 4 to 6 feet, 12 to 14 feet, and 14 to 16 feet, ranging in concentration from 500 ug/kg to 950 ug/kg, the highest concentration detected in any media sampled. The frequency of detection of volatile organics, as shown in Table 3-3, is greatest in this media as compared to other media involved in this sampling program. Acetone and toluene were detected in 56% of the samples. The distribution is again random and the source of subsurface volatile organics is unknown.

Relatively high levels of bis(2-ethylhexyl)phthalate (4,000 ug/kg) were detected in sample GT-06. Sample GT-05, collected during the installation of off-site well nest 105, contained detectable levels (1,800 ug/kg) of bis(2-ethylhexyl) phthalate from 8 to 10 feet. The source of the bis(2-ethylhexyl)phthalate at this location is unknown. Sample GT-01, collected during the drilling of on-site well nest 101, contained high levels of bis(2-ethylhexyl)phthalate (6,600 ug/kg) collected from 6 to 8 feet. The concentration

TABLE 3-4

SUMMARY OF RANGES OF SEMIVOLATILE ORGANIC COMPOUNDS OF POTENTIAL CONCERN
DETECTED IN SAMPLED MEDIA

HIMCO DUMP SITE
ELKHART, INDIANA
1990

Compound	Surface Soil ug/kg	Suspected Wetland Soil ug/kg	Subsurface Soil ug/kg	Groundwater ug/l	Residential ug/l	Surface Water ug/l	Sediment ug/kg
Acenaphthene	ND	140-310	ND	ND	ND	ND	ND
Anthracene	ND	130-240	ND	ND	ND	ND	ND
Benzoic Acid	75	280-1,300	ND	ND	ND	ND	93-190
Benzo(a)anthracene	ND	280-1,300	ND	ND	ND	ND	ND
Benzo(b)fluoranthene	ND	67-3,200	ND	ND	ND	ND	ND
Benzo(k)fluoranthene	ND	82-1,700	ND	ND	ND	ND	ND
Benzo(g,h,i)perylene	ND	560-3,500	ND	ND	ND	ND	ND
Benzo(a)pyrene	ND	430-2,200	ND	ND	ND	ND	ND
bis(2-ethylhexyl)phthalate	150-900	94-7,800	38-4,000	3-32	21-50	ND	46-180
Butylbenzylphthalate	ND	ND	ND	11	ND	ND	ND
Chrysene	ND	86-1,600	ND	ND	ND	ND	ND
di-n-butylphthalate	110-130	490	86-140	ND	ND	ND	ND
di-n-octylphthalate	ND	ND	ND	2-8	ND	ND	ND
Dibenzo(a,h)anthracene	ND	94-550	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	120-210	ND	75-120	ND	ND	ND	ND
Diethylphthalate	ND	ND	140	ND	ND	ND	ND
Dimethylphthalate	ND	ND	ND	2-9	ND	ND	ND
Fluorene	ND	120	ND	ND	ND	ND	ND
Fluoranthene	ND	120-2,800	ND	ND	ND	ND	ND
Indeno(1,2,3,-cd)pyrene	ND	620-3,700	ND	ND	ND	ND	ND
Phenanthrene	ND	190-1,500	ND	ND	ND	ND	ND
Pyrene	ND	110-2,000	ND	ND	ND	ND	ND

ND - None Detected

A/P/HIMCO/AI8

TABLE 3-5

FREQUENCY OF SEMIVOLATILE ORGANIC COMPOUNDS OF POTENTIAL CONCERN
DETECTED IN SAMPLED MEDIA

HIMCO DUMP SITE
ELKHART, INDIANA
1990

Compound	Surface Soil	Suspected Wetland Soil	Subsurface Soil	Groundwater	Residential	Surface Water	Sediment
Acenaphthene		2					
Anthracene		2					
Benzoic Acid	1						2
Benzo(a)anthracene		4					
Benzo(b)fluoranthene		5					
Benzo(k)fluoranthene		5					
Benzo(g,h,i)perylene		4					
Benzo(a)pyrene		4					
bis(2-ethylhexyl)phthalate	10	7	20	6	2		2
Butylbenzylphthalate				1			
Chrysene		5					
di-n-butylphthalate	2	1	8				
di-n-octylphthalate				2			
Dibenzo(a,h)anthracene		2					
1,4-Dichlorobenzene	2		9				
Diethylphthalate			1				
Dimethylphthalate				5			
Fluorene		1					
Fluoranthene		5					
Indeno(1,2,3,-cd)pyrene		4					
Phenanthrene		4					
Pyrene		5					
Total Number of Samples Collected	12	16	30	68	8	12	12

A/P/HIMCO/AI9

TABLE 3-6

SUMMARY OF INORGANIC COMPOUNDS OF POTENTIAL CONCERN
DETECTED IN SAMPLED MEDIA

HIMCO DUMP SITE
ELKHART, INDIANA
1990

COMPOUND	SURFACE SOIL MG/KG	SUSPECTED WETLAND SOIL MG/KG	SUBSURFACE SOIL MG/KG	GROUNDWATER UG/L	RESIDENTIAL WELLS	SURFACE WATER UG/L	SEDIMENT MG/KG
Aluminum	9-266	1,260-6,780	395-5,720	23.6-113,000	383-699	30.9-476	900-2,690
Antimony	7.7-46.8	11.8-13.6	5.3-13	31.2-63.4	4.2	ND	
Arsenic	ND	47-5.8	.28-5.6	1-54.5	2.4-4.1	2.2-4.7	1.5-4.2
Barium	1.3-4	5.8-101	2.4-62	6.4-510	5.9-416	29.2-54.5	3.5-12.6
Beryllium	.45-.78	.31-.91	.27-.71	1.2-13.2	1.0	ND	.39
Cadmium	1.1	ND	ND	7	.34-117	ND	ND
Calcium	226,000-321,000	360-43,700	162-117,000	14,100-217,000	703-194,000	56,600-77,300	207-32,000
Chromium	ND	2.9-13.2	1.8-67.4	4.3-354	65.8	29	1.9-8.2
Cobalt	ND	1.7-5.3	1.7-4.9	5.2-28.6	13.4	ND	2-5.7
Copper	1.9-19.3	1.6-216	2.2-12	3.7-139	10.4-256	ND	1.2-10
Cyanide	ND	1.3-24.3	.2-2.4	ND	ND	ND	ND
Iron	9.8-298	1,570-9,910	1,410-8,880	56.5-39,300	73.4-15,600	69.6-5,080	1,400-19,10(
Lead	.5-1.7	1.6-245	1.1-8.1	1.1-106	3.5-182	2-3.6	1.6-7.6
Magnesium	14.6-1,420	511-11,500	421-23,800	2,650-50.400	4020-62,900	8,900-21,500	389-13,900
Manganese	1.3-11.9	18.3-561	24.6-421	2.1-2,070	5.6-1570	11.7-76.7	12.7-367
Mercury	ND	.23-.54	.21	.2-1	ND	ND	ND
Nickel	ND	2.7-12	3.8-36.4	21.1-111	76.5	7.5-10.2	1.5-8
Potassium	ND	141-678	82.4-406	468-29,300	473-19,500	1,360-3,600	82.1-176
Selenium	.36	.27-1.4	.25-.67	2-33	ND	ND	.56-1.1
Silver	1.9-2.8	ND	ND	6.9-18.4	ND	ND	1.1
Sodium	31.4-77.8	20.8-68.10	26-87.2	1,850-91,000	5270-438,000	9,330-12,200	17.6-81.5
Thallium	ND	ND	ND	ND	1.9-3.5	ND	10.8
Vanadium	1.6-2.9	3.9-19.1	1.8-15	4.5-106	14	3.5	2.3-9.8
Zinc	ND	ND	4.5-22.4	4.9-538	49.9-107,000	5.5-37.6	5.7-25.5

ND - None Detected

TABLE 3-7

FREQUENCY OF INORGANIC COMPOUNDS OF POTENTIAL CONCERN
DETECTED IN SAMPLED MEDIA

HIMCO DUMP SITE
ELKHART, INDIANA
1990

COMPOUND	SURFACE SOIL	SUSPECTED WETLAND SOIL	SUBSURFACE SOIL	GROUNDWATER	RESIDENTIAL WELLS	SURFACE WATER	SEDIMENT
Aluminum	8	16	30	44	2	12	12
Antimony	11	2	8	23	1	ND	ND
Arsenic	ND	15	27	28	6	7	12
Barium	7	15	27	64	8	12	12
Beryllium	5	12	9	11	1	ND	1
Cadmium	1	ND	ND	1	3	ND	ND
Calcium	12	16	3	68	8	12	12
Chromium	ND	16	29	10	1	1	12
Cobalt	ND	15	23	6	1	ND	9
Copper	7	16	30	34	5	ND	12
Cyanide	ND	ND	2	ND		ND	ND
Iron	11	16	30	59	8	12	12
Lead	6	16	30	34	4	11	12
Magnesium	7	16	30	68	7	12	12
Manganese	11	16	30	67	7	12	12
Mercury	ND	2	1	ND		ND	ND
Nickel		14	16	4	1	2	12
Potassium		12	22	68	6	12	12
Selenium	1	7	4	15		ND	6
Silver	3	ND	ND	17		ND	1
Sodium	2	4	6	68	8	12	12
Thallium	ND	ND	ND	ND	2	ND	1
Vanadium	4	16	30	30	1	1	12
Zinc	ND	ND	30	45	8	12	12
Total Samples Collected	**12**	**16**	**30**	**68**	**8**	**12**	**12**

ND - None Detected

reported may be attributed to the presence of plastic observed during drilling activities. Other semivolatiles detected include di-n-butylphthalate (86-140 ug/kg), 1,4,-dichlorobenzene (75-120 ug/kg) and diethylphthalate (140 ug/kg).

Inorganics detected in subsurface soil samples are also summarized in Table 3-6. The highest concentrations were detected for aluminum (395-5720 mg/kg), calcium (16.2-117800 mg/kg), iron (1410-8880 mg/kg), and magnesium (421-23800 mg/kg). Cyanide was also detected in two subsurface soil samples GT06E (0.2 mg/kg) and GT01F (2.4 mg/kg).

Subsurface soil samples were also compared to typical ranges of concentrations for native soils. As outlined in Table 3-9 the ranges were exceeded for magnesium and mercury. Concentrations and sample locations are provided in Table 3-10.

3.5.2.3 Suspected Wetland Soil

Volatile organics detected in the suspected wetland soil samples are listed in Table 3-2. As with surface soil samples, acetone was again detected at the highest concentration of 140 ug/kg at sample location WS-01. Detectable concentrations of volatile organics also included trichloroethane (0.9 ug/kg), toluene (10-31 ug/kg), and ethyl benzene (0.7-2 ug/kg). Carbon disulfide was also detected at 0.8 ug/kg in a field duplicate for sample location WS-05; however, this VOC was not detected in any other suspected wetland soil sample. The source of volatile organics is unknown.

Semivolatiles detected in suspected wetland soil samples are summarized in Table 3-4. The suspected wetland soil samples are characterized by detectable levels of Polynuclear Aromatics (PNAs). WS05 contained detectable levels of PNAs at 279 to 465 ug/kg. The source of the PNAs at this location is not known. Other detectable levels of PNAs included WS13 with total PNAs of 12,994 ug/kg; WS15 with total PNAs of 6,590 ug/kg; and WS16 with total PNAs of 22,590 ug/kg. The total PNA concentration is calculated by adding the individual concentrations of the PNAs listed in Table 3-11 for each sample location. Table 3-12 summarizes the distribution of PNAs on suspected wetland soil. Sample locations WS13, WS15 and WS16 were located in an area of visible construction debris, along the southern border of the site. This debris may be the source of contamination. PNAs are derived from coal, tar and asphalt. It should also be noted that the highest levels of bis(2-ethylhexyl)phthalate (94-7800 ug/kg) were also detected in this media. Other than the area encompassed by WS13, WS15, and WS16, the distribution of semivolatile organics is random. From historical photographs, it appears that this area was previously standing water and from 1973 to the present, has been filled with indiscriminate dumping.

Inorganics detected in suspected wetland soil samples, as indicated by Table 3-6, were also detected in subsurface soil samples, with the exception of zinc. Zinc was detected in subsurface soil but not in suspected wetland soil. The range of concentration of compounds were also detected at the same proportion as in subsurface soil samples, with aluminum, calcium, iron and

TABLE 3-8

EXCEEDANCES OF CONCENTRATIONS OF SOME NATURALLY OCCURRING

ORGANIC CHEMICALS IN SOIL

FOR SURFACE SOILS

COLLECTED AT HIMCO DUMP

	TYPICAL RANGE (ppm)	WS-03	WS-05	WS-13	WS-15	WS-16	WS-07	WS-08	WS-09	WS-12	WS-15	WS-16
ORGANICS												
BENZO(A)ANTHRACENE	0-0.01	0.28		1.10	0.41	1.30						
BENZO(B)FLUORANTHENE	0-0.03	0.66	0.067	1.10	0.77	3.20						
BENZO(K)FLUORANTHENE	0-0.015	0.36	0.082	0.93	0.43	1.70						
BENZO(G,H,I)PERYLENE	0-0.02	0.56		0.97	0.67	3.50						
FLUORANTHENE	0-0.4			2.8	0.59	1.8						
PYRENE	0-0.015	0.31	0.11	2.0	0.62	1.8						
INORGANIC												
COPPER	2-100					216						
LEAD	2-200					245						
MAGNESIUM	600-6000						9570	11500	10200	6910		
MERCURY	0.01-0.08										0.23	0.54

TABLE 3-9
EXCEEDANCES OF TYPICAL RANGES OF CONCENTRATIONS
FOR NATIVE SOILS
FOR SUBSURFACE SOILS
COLLECTED AT HIMCO DUMP

	TYPICAL RANGE (ppm)	GT-01 (10-12 ft) interval	GT-03 (0-2 ft) interval	GT-03 (2-4 ft) interval	GT-03 (4-6 ft) interval	GT-03 (6-8 ft) interval	GT-03 (14-16 ft) interval	GT-05 (8-10 ft) interval	GT-05 (12-14 ft) interval	GT-05 (14-16 ft) interval	GT-06 (8-10 ft) interval	GT-06 (12-14 ft) interval	GT-06 (14-16 ft) interval
INORGANICS													
MAGNESIUM	600-6000		10,200	23,800	6,730	6,910	13,400	6,570	6,380	8,170	8,790	7,290	11,000
MERCURY	0.01-0.08	0.21											

TABLE 3-10

EXCEEDANCES OF TYPICAL RANGES OF CONCENTRATIONS
FOR NATIVE SOILS

Compound	Typical Range (ppm)	Location	Depth (ft)	Detected Concentration (mg/kg=ppm)
Copper	2-100	WS-16		216
Lead	2-200	WS-16		245
Magnesium	600-6,000	GT-03B		23,800
		GT-03H	14-16	13,400
		WS-08		11,500
		GT-06H	14-16	11,000
		WS-09		10,200
		GT-03A	0-2	10,200
		WS-07		9,570
		GT-06E	8-10	8,790
		GT-06G	12-14	7,290
		GT-03D	6-8	6,910
		WS-12		6,910
		FDGT-03C	4-6	6,800
		GT-03C	4-6	6,730
		GT-05E	8-10	6,570
		GT-05G	12-14	6,380
		GT-05H	14-16	6,170
Mercury	0.01-0.08	WS-16		0.54
		WS-15		0.23
		GT-01F	10-12	0.21

ARCS/P/HIMCO/AK0

TABLE 3-11

SUMMARY OF POLYNUCLEAR AROMATICS (PNAs)
COMPRISING TOTAL PNA CONCENTRATION
1990

Acenaphthene	Benzo(a)anthracene
Fluorene	Benzo(b)fluoranthene
Phenanthrene	Benzo(k)fluoranthene
Anthracene	Indeno(1,2,3-cd)pyrene
Fluoranthene	Benzo(ghi)perylene
Pyrene	Benzo(a)pyrene
Chrysene	Dibenzo(a,h)anthracene

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TABLE 3-12

DISTRIBUTION OF PNAS IN WETLAND SOIL SAMPLES
1990

ACENAPHTHENE	FLOURENE	BENZO(A)ANTHRACENE	BENZO(G,H,I)PERYLENE	ANTHRACENE
WS-13(140)	WS-13(120)	WS-03(280)	WS-03(560)	WS-13(240)
WS-16(310)		WS-13(1100)	WS-13(970)	WS-16(130)
		WS-15(410)	WS-15(670)	
		WS-16(1300)	WS-16(3500)	

FLOURANTHENE	BENZO(B)FLUORANTHENE	DI-BENZO(A,H)ANTHRACENE	CHRYSENE
WS-03(330)	WS-03(660)	WS-13(94)	WS-03(360)
WS-05(120)	WS-05(67)	WS-16(550)	WS-05(86)
WS-13(2800)	WS-13(1100)		
WS-15(590)	WS-15(770)		
WS-16(1800)	WS-16(3200)		

PHENANTHRENE	BENZO(K)FLOURANTHENE	INDENO(1,2,3-CD)PYRENE	PYRENE	BENZO(A)PYRENE
WS-03(190)	WS-03(360)	WS-03(620)	WS-03(310)	WS-03(430)
WS-13(1500)	WS-05(82)	WS-13(1000)	WS-05(110)	WS-13(1000)
WS-15(230)	WS-13(930)	WS-15(690)	WS-13(2000)	WS-15(590)
WS-16(800)	WS-15(430)	WS-16(3700)	WS-15(620)	WS-16(2200)
	WS-16(1700)		WS-16(1800)	

NOTES:

WS-13 = SAMPLE LOCATION
( ) = concentration detected at sample location, in ug/Kg

A/P/H/AJ8

magnesium being detected at highest ranges, followed by manganese and potassium. The range of concentrations of lead and copper were significantly higher (at least 18 times higher) than ranges found in surface or subsurface soils. Cyanide was detected in suspected wetland soil samples WS13 (1.3 mg/kg), WS15 (2.0 mg/kg) and WS16 (24.3 mg/kg). This is also the area where high PNA concentrations were detected.

Typical ranges of concentrations for native soils were exceeded for copper, lead, magnesium and mercury. Refer to Table 3-10 for sample locations and concentrations.

Small amounts of 4,4-DDT (64 ug/kg) were found in suspected wetland soil sample WS15.

3.5.3 Groundwater Sample Results

3.5.3.1 Groundwater

Volatile organics detected in groundwater are also summarized in Table 3-2. The frequency of detection of volatile organics is provided in Table 3-3. Chlorobenzene (0.9 ug/L), dibromochloromethane (1-5 ug/L), 2-hexanone (0.7-1 ug/L), and bromodichloromethane (0.7-6) were detected in this media only, at sample locations identified in Table 3-2. In addition, chloroethane was detected from 2-12 ug/L at shallow well P101B and WT106A. Chloroform was detected in existing USGS wells I-1 (4 ug/L), B-4 (4 ug/L), G-3 (3 ug/L) and CP-1 (1 ug/L). Ethyl ether, a tentatively identified compound, was detected at WT101A (27 ug/L), WT106A (18 ug/L), WTN-1 (7 ug/L), WTQ-1 (22 ug/L), and P101B (10 ug/L). The concentration of ethyl ether was similar to those found in residential wells located downgradient of the site. The source of ethyl ether is unknown. Downgradient well P106A contained detectable levels of 1,2-dichloroethane. Detectable levels of acetone (240-270 ug/L) were found in USGS well nest I, located downgradient and off-site. Smaller concentrations of acetone were detected in USGS wells Q-1 (17 ug/L), G-1 (39 ug/L) and N-1 (9 ug/L). The presence of acetone may possibly be attributed to subsurface acetone soil contamination. Trichloroethane was detected in USGS wells B-1 (2 ug/L), J-1 (42 ug/L), J-2 (18 ug/L) and F-2 (0.2 ug/L). Tetrachloroethane was detected in USGS well G-3 at 0.6 ug/L. These two contaminants do not appear to be related to the Himco Dump site as they were not detected in wells placed immediately downgradient of the site in the path of the leachate plume.

Semivolatiles detected included bis(2-ethylhexyl)phthalate (3-32 ug/kg), butylbenzylphthalate (11 ug/kg), di-n-octylphthalate (2-8 ug/kg) and dimethylphthalate (2-9 ug/kg).

The inorganic groundwater results were compared to Maximum Contaminant Levels (MCLs) and Secondary Maximum Contaminant Levels (SMCLs) to determine exceedances. A MCL is the maximum permissible level of a contaminant in water which is delivered to any user of a public water system. MCLs are legally enforceable. SMCLs are non-enforceable and establish limits for contaminants in water which may affect the aesthetic qualities of drinking water (e.g. taste and odor). Tables 3-13 and 3-14 provide MCLs, SMCLs and groundwater data for USGS and U.S. EPA wells, respectively. The inorganic compound concentrations provided on Tables 3-13 and 3-14 were detected in groundwater samples which were filtered in the field. Filtered results have been used for comparison to MCLs because filtered groundwater better resembles the groundwater ingested by surrounding residents than unfiltered groundwater does. Antimony, beryllium and nickel were not included on Tables 3-13 and 3-14 because the MCLs for these inorganic compounds are proposed, not final, and as such are not considered ARARs. Detected metals exceeding MCLs occurred in USGS shallow well E for arsenic, chromium, lead and nickel and off-site USGS well J for chromium. Chromium contamination occurred sidegradient of Himco and is not believed to be due to the Himco dump site.

USGS Wells

Volatile Organic Compounds (VOCs) Trichloroethene was detected at levels exceeding the MCL by three times to an order of magnitude in wells J1 and J2. All other wells did not have any VOC MCL exceedances. There is a possibility that the source of the contamination detected in wells J1 and J2 may be unrelated to the Himco Dump because 1,2 dichloroethene and trichloroethene were not detected in wells located between the Himco Dump and well nest J. For this reason, it has been concluded that the contamination in wells J1 and J2 was not caused by a source at Himco Dump.

Semi-Volatile Organic Compounds (SVOCs) Butylbenzylphthalate was detected in well Q1 at a level three times the MCL. All other wells did not have any SVOC MCL exceedances. There is a possibility that the source of the contamination detected in well Q1 may be unrelated to the Himco Dump because butylbenzylphthalate was not detected in wells located between the Himco Dump and well Q1. For this reason, it has been concluded that the contamination in well Q1 was not caused by a source at Himco Dump.

Metals Arsenic was detected in well E2 at approximately the MCL; lead was detected in well B4 at the MCL level and at two times the MCL level in well E2. The SMCL for iron was exceeded in eight wells; the SMCL for manganese was exceeded in ten wells.

U.S. EPA Wells

Volatile Organic Compounds (VOCs) There were no exceedances of MCL for volatile organic compounds detected in groundwater samples.

Semi-Volatile Organic Compounds (SVOCs) There were no SVOC MCL exceedances.

Metals The MCL for cadmium was exceeded in well 106A. All other wells did not have any metal MCL exceedances. The SMCL for iron was exceeded in five wells; the SMCL for manganese was exceeded in six wells.

TABLE 3 – 13
SUMMARY OF USGS WELLS EXCEEDING MCLs AND SMCLs
(ALL CONCENTRATIONS IN UG/L)

	MCL UG/L	SMCL UG/L	B3	B4	E2	E3	F1	G1	I3	J1	J2	J3	M1	M2	N1	O1	Q1
VOLATILE ORGANIC COMPOUNDS																	
TRICHLOROETHENE	5									42	18						
SEMI – VOLATILE ORGANIC COMPOUNDS																	
BUTYLBENZYLPHTHALATE	4																11
INORGANIC COMPOUNDS																	
ARSENIC	50				54.5												
IRON		300	510		444	2640		433	366				6140	1670			4540
LEAD	15			58	106			24									
MANGANESE		50	445	144			81			78.7		91.3	77.6	404	126	113	151

NOTES;

1. USGS WELLS B1, B2 CP1 (ON–SITE), AND F2, F3, G3, I1, I2 (OFF–SITE) DID NOT SHOW ANY EXCEEDANCES OF MCLs OR SMCLs.

2. CONCENTRATION PROVIDED FOR BIS (2–ETHYLHEXYL) PHTHALATE AT THE REQUEST OF THE RPM.

TABLE 3 – 14
SUMMARY OF US EPA WELLS EXCEEDING MCLs AND SMCLs
(ALL CONCENTRATIONS IN UG/L)

	MCL UG/L	SMCL UG/L	101A	101B	101C	102B	102C	103A	104A	106A
INORGANIC COMPOUNDS										
CADMIUM	5									7
IRON		300	24500		7890		1680		664	3630
MANGANESE		50	1950	64.6		123	165	95.3		220

NOTES:

1. USGS WELLS B1, B2 CP1 (ON–SITE), AND G3, I1, I2 (OFF–SITE) DID NOT SHOW ANY EXCEEDANCES OF MCLs OR SMCLs.
2. CONCENTRATION PROVIDED FOR BIS (2–ETHYLHEXYL) PHTHALATE AT THE REQUEST OF THE RPM.

3.5.3.2 Residential Wells South of Himco Dump Site

Volatiles detected in residential wells are summarized in Table 3-2. As indicated by Table 3-15, the Kolanowski shallow well has the highest frequency of volatile organics detected. In several cases, the volatiles detected in this well were not found in other residential wells. Table 3-15 summarizes the distribution of detected volatile organics. The most common volatile was methylene chloride detected in seven of the eight wells sampled. All other volatiles were detected at a rate of 12.5% and 50% for acetone. Ethyl ether, a tentatively identified compound was detected in the Kolanowski shallow and deep well, the Rumfelt shallow well, the Freeman deep well (duplicate only), and the deep wells of Geesaman, Klein and Bowers.

The only semivolatile detected in residential wells was bis(2-ethylhexyl) phthalate, which was consistently detected in all media sampled. Phenobarbital (a tentatively identified compound) was detected in the Kolanowski well RW05 at 6.5 ug/L, in the Geesaman well at 5.5 ug/L and in the Klein well RW07 at 6 ug/L. Phenobarbital was not detected in any other media.

Inorganics detected are summarized in Table 3-6. Results and ranges of concentrations were similar to inorganics detected in groundwater. Compounds detected in groundwater but not in residential wells include selenium, silver and mercury. The concentrations of iron, potassium, sodium, and zinc in downgradient wells are 3 to 10 times higher than those detected in wells east of the site discussed in section 3.5.3.3. Elevated levels of these metals are associated with the bromide plume originating from the Himco site.

Water quality results are provided in Table 3-21. Bromide was considered significant (greater than 0.3 mg/L) in the Bowers, Kolanowski, Klein and Geesaman wells.

Inorganic and organic results were compared to MCLs and SMCLs. A summary of this comparison is provided in Table 3-16.

3.5.3.3 Residential Wells East of Himco Dump Site

Nine residences located one to two blocks east of the site, across Nappannee Road Extension were sampled for chemical analysis. The samples were collected by the FIT team in April 1990. No field blank or duplicate results were included in sampling activities to assess the field precision and accuracy, and no QAPP was prepared. When comparing the data obtained to that obtained during the RI, reasonable agreement was achieved. A summary of the detected metals in the wells east of the site is provided in Table 3-17. Detection limits for several metals exceeded the respective MCL. Detection limits and MCLs for these metals are provided in Table 3-18. The exact depth and construction of these wells is not available at this time, however, obtaining this information is proposed for Phase II field work. Concentrations of aluminum, barium, calcium, and magnesium are similar to those detected in downgradient wells. Volatile organics were detected in only one well east of the site (Quick) for chloroform at 1.4 ug/L, which is just above the detection

TABLE 3-15

DISTRIBUTION OF DETECTED ORGANICS IN RESIDENTIAL WELLS
1990

Toluene	Acetone	Benzene	Chloroethane	Methylene Chloride	1,1-Dichloroethane	1,1,1-Trichloroethane	Bis(2-ethylhexyl)phthalate
[redacted] (shallow)	[redacted]	[redacted] (shallow)	[redacted] (shallow)	[redacted] (shallow)	[redacted] (shallow)	[redacted] (shallow)	[redacted] (shallow)
	[redacted] (shallow)			[redacted]			
	[redacted] (deep)			[redacted]			
	[redacted] (shallow)			[redacted] (deep)			
				[redacted] (shallow)			
				[redacted] (deep)			
				[redacted] field duplicate			

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TABLE 3-16

SUMMARY OF RESIDENTIAL WELLS EXCEEDING MCLs AND SMCLs
1990

Compound	MCL	SMCL	[redacted] (Deep)	[redacted] (Shallow)	[redacted]	[redacted] (Deep)	[redacted] (Shallow)	[redacted]	[redacted]	[redacted]
	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
Iron		300	664[b]	15,600[b]	708[b]	318[b]	147,000[b]	6,890[b]	73.4	4,140[b]
Benzene	5		ND	ND	ND	ND	5[b]	ND	ND	ND
Cadmium	5		ND	6.6[b]	ND	ND	117[b]	0.34	ND	ND
Beryllium	1		1[d]	ND	ND	ND	ND	ND	ND	ND
Lead	15		ND	182[b]	ND	ND	2,380[b]	3.5	ND	4
Manganese		50	53.6[b]	223[b]	186[b]	5.6	1,570[b]	89.4[b]	ND	98.7[b]
Zinc		5000	173	4890	49.9	114	103,000[b]	1270	88.6	631
TDS[c]		500[c]	191[c]	700[b, c]	234[c]	718[b, c]	1,060[b, c]	976[b, c]	1,050[b, c]	950[b, c]
Sulfate[c]		250[c]	ND	270[b, c]	54[c]	147[c]	200[c]	175[c]	190[c]	260[b, c]

[a] sample contained elevated levels of suspended solids indicating potential for poor well development
[b] value meets or exceeds MCL or SMCL
[c] value is in mg/l
[d] detected in field duplicate
ND not detected

TABLE 3-17

DETECTED METALS IN RESIDENTIAL WELLS - EAST OF HIMCO DUMP
APRIL 1990

Units: ug/l ND = 100 ug/l

Detected Metal	[redacted]								[redacted]		sd	rsd
Aluminum	1,220	350	780	670	650	980	580	510	110	650	327	50
Barium	ND	ND	ND	ND	150	140	ND	ND	ND	71	42	59
Calcium	119,000	43,500	68,000	59,700	75,200	80,300	72,500	81,100	ND	66,600	32,000	48
Iron	2,290	ND	490	880	1,100	2,240	ND	ND	ND	800	918	115
Magnesium	29,600	13,500	18,200	20,300	22,300	25,000	19,300	22,000	ND	18,900	8,366	44
Manganese	ND	ND	ND	370	150	190	ND	ND	ND	112	110	98
Potassium	750	130	1,290	250	760	1,040	110	890	360	620	424	68
Sodium	13,600	1,450	66,400	1,400	2,610	10,600	15,400	12,700	ND	13,800	20,600	149
Zinc	370	ND	200	100	120	ND	ND	ND	ND	115	108	94
Mercury	ND	ND	ND	ND	ND	0.2	ND	0.3	ND	0.1	0.07	71

<u>Notes</u>:

*Undetected values (ND) taken as 0.5 x 100 ug/l or 50 ug/l in the calculation of the mean, mercury taken as 0.1 ug/l.
**Data in this Table were collected from FIT samples instead of RI samples.

TABLE 3-18

DETECTION LIMITS EXCEEDING MCLs or RMCLs

Metal	MCL (ug/L)	Lab Detection Limit (ug/L)
Arsenic	50	100
Cadmium	10	100
Chromium	50	100
Lead	50	100
Selenium	10	100
Silver	50	100

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limit (1 ug/L) and well below the drinking water standard of 100 ug/L for total trihalomethanes. Chloroform was not detected in the samples collected from new or residential wells sampled during the RI activities. Trace levels of volatiles in residential wells associated with the bromide plume (ethyl ether, benzene) were not detected or reported in wells east of the site. From the sample results, it appears that the groundwater in residential wells located east of Nappannee Road Extension are sidegradient and are not impacted by the Himco site. No MCLs or MCLGs were exceeded.

3.5.4 Surface Water Sample Results

Volatiles detected in surface water included carbon disulfide, ethyl benzene, 4-methyl-2-pentanone, methylene chloride, and xylene (total). The concentrations detected were relatively small. Methylene chloride was detected at the highest concentration for this media (30 ug/L). However, the field duplicate for this same sample location detected methylene chloride at a concentration four times that of the sample (120 ug/L). The source of volatiles is unknown.

No semivolatiles were detected in surface water samples.

Samples collected from surface water were analyzed for inorganic parameters. Results and frequency of the inorganic analysis for each media is provided in Tables 3-6 and 3-7. In general, inorganic concentrations were relatively small and the distribution appeared to be widespread.

In addition, surface water inorganic concentrations were compared to Indiana's Water Quality Criteria (327 IAC 2-1) to verify any exceedances and is outlined in Table 3-19. The continuous criterion concentrations, the most stringent of criteria, were exceeded for arsenic and barium. However, arsenic did not exceed the acute and chronic criteria. An acute and chronic criteria is not established for barium. Chromium in the surface water in the quarry exceeded the criterion of 11 mg/L for chronic exposure and 16 mg/L for acute exposure. Lead exceeded the criterion of 1.3 ppb in all three surface water bodies.

3.5.5 Sediment Sample Results

Very small levels of volatile organics were detected in sediment samples as outlined in Table 3-2. The highest concentration of any volatile was for acetone, which was detected in all sampled media. The frequency of detection for volatiles in sediment was approximately 8% with the only variation being for acetone which was detected at approximately 6% of the sample locations. The distribution appears to be scattered.

The only semivolatiles detected in sediment samples were benzoic acid (93-190 ug/kg) and bis(2-ethylhexyl)phthalate (46-180 ug/kg).

TABLE 3-19
EXCEEDANCES OF INDIANA WATER QUALITY CRITERIA FOR SPECIFIC SUBSTANCES
TAKEN FROM 327 IAC 2-1
FOR SURFACE WATER SAMPLES
COLLECTED AT HIMCO DUMP

INORGANICS	CONTINOUS CRITERION CONCENTRATIONS		ACUTE CRITERION	CHRONIC CRITERION	SS-01	SS-02	SS-03	SS-04	SS-05	SS-06	SS-07	SS-08	SS-09	SS-10	SS-11	SS-12
	OUTSIDE OF MIXING ZONE	POINT OF WATER INTAKE			(All Concentrations in ug/l)											
ARSENIC	0.175 ug/l (1)	0.022 ug/l (1)	360	190	2.6						4.7		2.3	2.4	2.2	2.6
BARIUM		1.0 ug/l (2)			32.1	33.4	30.5	31.0	29.2	32.0	41.6	29.2	51.6	54.1	54.5	53.9
CHROMIUM			16	11												29
LEAD			1.3		2.5	3.6		2.3	2.2	2.3	3.3	2.4	2	2.6	2.2	2.4

(1) – value derived from nonthreshold cancer risk
(2) – value derived from drinking water standards, equal to or less than threshold toxicity

Inorganic sample results were compared to background concentrations established by Indiana Department of Environmental Management (IDEM) for Indiana stream and lake sediments. Table 3-20 provides the results of this comparison. Background concentrations were exceeded for selenium, silver and thallium. All other concentrations were less than the maximum background concentrations.

Aroclor-1248 (130 ug/kg) was detected in sediment sample SD03, from the L-shaped pit. The source is unknown.

Pesticides were detected in only one media, sediment, and do not appear to be characteristic of the Himco Dump site.

3.5.6 Water Quality Results

Groundwater, residential wells and surface water were analyzed for alkalinity, dissolved bromide, Chemical Oxygen Demand (COD), chloride, ammonia nitrogen, nitrate plus nitrite, sulfate, Total Dissolved Solids (TDS), Total Kjehldahl Nitrogen (TKN), total phosphorus and Total Suspended Solids (TSS). A summary of analytical results is provided in Table 3-21.

Concentrations were compared to MCL and SMCL and were considered significant if they were exceeded or if the detection limit for bromide was exceeded by a factor of 3. A summary of samples exceeding SMCLs is provided in Table 3-22. Significant bromide concentrations (greater than or equal to 0.3 mg/L) were detected in shallow wells P-101A and P-106A. Intermediate wells P101-B and M-2 also contained detectable bromide as well as deep wells E-3 and P-101C. Off-site wells Q-1 and I-3 contained detectable bromide. Bromide concentrations have been decreasing in the deep wells since the USGS study measured levels in 1979. Concentrations detected in shallow wells previously by the USGS ranged from 0.8 to 7.1 mg/L. The highest concentration reported during the RI was 3.9 mg/L.

It also appears that the Kolanowski shallow well is impacted from the fill leachate, as indicated by the high levels of water quality parameters, which were not detected further downgradient of the site.

3.5.7 Surface Water Drainage Analysis

The purpose of the surface water runoff analysis was to assess historical and future surface water flow off-site from the dump to areas west of the dump. The results of the analysis were also used to determine if additional soil sampling is required at areas west of the dump site.

The analysis was conducted by delineating drainage areas, determining surface water flow paths, and routing flows through two on-site ponds. Specific runoff parameters such as drainage area (acres), time of concentration, and runoff curve number were obtained to assist in conducting the analysis. Time of concentration is defined as the time necessary for surface runoff to reach the outlet of the drainage area from the most remote point in the drainage area.

TABLE 3–20

EXCEEDANCES OF MAXIMUM BACKGROUND CONCENTRATION OF POLLUTANTS

FOR SEDIMENT SAMPLES COLLECTED AT HIMCO DUMP

(ALL CONCENTRATIONS IN MK/KG)

INORGANIC	MAXIMUM BACKGROUND (mg/kg)	SD–01	SD–02	SD–04	SD–05	SD–06	SD–08	SD–10	SD–11	SD–12
SELENIUM	0.55	0.67		0.81		0.71	0.79	1.10	0.66 *	0.56
SILVER	less than 0.5				1.10					
THALLIUM	less than 3.8		10.8							

TABLE 3-21

SUMMARY OF WATER QUALITY PARAMETERS
MEASURED IN SAMPLED MEDIA

	SMCL mg/l	Groundwater mg/l	Surface Water mg/l	Residential mg/l
Alkalinity		2.9-510	90-158	177-948
Bromide		0.1-3.5	.1	.2-3.9
COD		6.2-15	5-42	11-247
Chloride	250	0.16-260	19-38	5-56
Nitrogen (NH_3)		0.10-30	Not Reported	.12-37
Nitrogen, NO_2+NO_3	10*	0.14-6.9	.17-.76	.64
Sulfate	400/500* 250	5.9-810	42-155	13-270
TDS	500	110-1,500	88-384	191-1,060
TKN		0.12-41	.2-1.5	.22-64
Total Phosphorus		0.09-.4	.02-.08	.02-.06
TSS		0.53-350	2-10	2-462

* MCL value

A/P/HIMCO/AI3

TABLE 3-22

SUMMARY OF WATER QUALITY PARAMETERS
EXCEEDING SMCLs

Parameter	SMCL	Location	Concentration (mg/L)
Sulfate			
Groundwater	250	102A	430 and 360
		101C	810
Residential Wells		[redacted]	260
		[redacted] (Shallow)	270
TDS			
Groundwater	500	CP-1	1300 and 1500
		J-2	940
		102A	810 and 910
		B-3	840
		101C	790
		M-1	750
		Q-1	620
		101B	610
		I-3	610
Residential Wells		[redacted] (Shallow)	1060
		[redacted]	1050
		[redacted]	976
		[redacted]	950
		[redacted] (Deep)	718
		[redacted] (Shallow)	700
Chloride			
Groundwater	250	O-1	260

The runoff curve number is a rainfall-runoff parameter commonly used in the U.S. Soil Conservation hydrologic procedures. The runoff curve number is a function of soil type, land use, and land management practices. The larger the curve number, the greater the percentage of rainfall that would appear as runoff.

Flows and runoff hydrographs for the two ponds were determined for the existing condition 2, 10, and 100-year flood events using the Army Corps of Engineers HEC-1 model. A hydrograph is a graph of discharge or runoff versus time, used to determine volume and rate of flow at the outlet, from the drainage area. Subbasin parameters and runoff patterns are outlined in Tables 3-23 and 3-24, respectively.

Analysis of the surface water runoff at Himco Dump site indicates that surface water runoff has historically or potentially will flow from the dump off-site to the west at the two locations near Subbasins C and D. Refer to enclosed plan sheet. Runoff will flow off-site from a small portion of Subbasin C near TT-04. Runoff will flow into Pond D from Subbasin D. Pond D will safely store 10-year flood flows without overtopping. However, Pond D will overtop during the 100-year flood event. In addition, the analysis also indicates that a minimum of two soil samples should be obtained to the west of the dump. A total of five samples, however, is desirable.

3.5.8 Wetland Delineation

A wetland identification and assessment was performed during Phase I RI activities. Three suspected wetland areas (designated as northwest wetland area, wetland remnant, and gravel pit wetland area) were investigated. These areas were not identified as wetlands. However, an area located just south of the gravel pit was identified as a wetland.

3.5.9 Waste Mass Gas Sampling

Waste mass gas samples were collected from twelve cap soil samples to select appropriate remedial alternatives and to develop the baseline Risk Assessment. The samples were collected at depths of 2 to 3 feet using a soil gas probe and off-site analysis for the TCL organics and up to ten tentatively identified compounds. Results of the analysis are summarized in Table 3-2. No detectable hydrogen sulfide, methane or volatile organics above 0.1 ppm were not detected in residential wells south of the site. Samples collected at location TT-05 consisted of ten volatiles above the background for total of 10,070 ng/L. Sample TT-10 contained nine different volatile organics consisting of freon constituents and vinyl chloride for a total of 12,950 ng/L. The field duplicate collected at TT-16 contained four volatile organics for a total of 770 ng/L. Other locations containing detectable levels of volatile organics include 1,1,1-trichloroethane at location TT-07; toluene at location TT-04, located off the fill in the woods and considered the off-site upgradient sample; Trichloroethane at location TT-11; and toluene at location TT-06.

TABLE 3-23

SUBBASIN PARAMETERS

Subbasin No.	Area (acres)	Area (sq. miles)	Time of Concentration (hours)	Lag Time (hours)	Curve Number
A	47	0.07	1.0	0.6	81 (1/2 residential, 1/2 open space)
B	43	0.07	0.5	0.3	90 (25% pond, 25% open space)
C	260	0.41	2.0	1.2	82 (Agricultural, open space)
D	38	0.06	0.8	0.5	90 (25% pond, 25% open space)
E	6	0.01	0.25	0.15	86

TABLE 3-24

SUMMARY OF RUNOFF PATTERNS

Subbasin No.	Drainage Area (Acres)	10-year Runoff (cfs)	100-year Runoff (cfs)	Comments
A	47	16	29	100 year runoff stored in Pond B
B	43	41	64	100 year runoff stored in Pond B
C	260	127	223	Runoff will flow to west near TT-04
D	38	32	52	10 year runoff will be stored in Pond D. 100 year runoff will overtop Pond B and flow west.
E	6	5	9	Runoff will flow west but flows is not in contact with dump.

ARCS/P/HIMCO/AJ5

For each of the volatile organic compounds detected during the Phase I waste mass gas sampling, the maximum concentrations were compared to Permissible Exposure Levels (PEL) contained in 29 CFR 1910. The mass gas samples are emission concentrations of these pollutants at 18 to 36 inches below the dump surface and the PELs apply to worker safety in the building. The comparison was made to assess the potential magnitude of emissions from the dump related to some exposure criteria. For exposure to occur, however, the mass gas concentrations measured need to migrate to the surface and be emitted into the atmosphere and dispersed downwind. However, the concentrations in the atmosphere would be much less than the subsurface concentration levels measured.

For all pollutants except vinyl chloride, the subsurface concentrations were below the final PELs. The vinyl chloride maximum concentration value was below the current PEL of 10 ppm, but was not below the final PEL of 1 ppm. These values indicate the workers on the landfill and residences off-site would have a very low exposure level. To more precisely determine this exposure level, the emission rates based on the subsurface emission concentrations need to be determined and used as input to a dispersion model to obtain atmospheric concentrations. A summary of the comparison of PELs to maximum concentrations is provided in Tables 3-25 and 26.

3.5.10 Residential Basement Air Screening

Basement gas was screened to evaluate if landfill gas, which may be generated at the site, has migrated off-site and into nearby resident's basements. The screening was qualitative to check for the presence of methane and hydrogen sulfide. Neither of these two landfill gases were detected during the screening activities.

3.5.11 Horizontal and Vertical Distribution of Contaminants

The data obtained from the Himco Dump site was evaluated by media type, class of analytes within each media, distribution, and frequency of detection. The data were evaluated using the criteria outlined in Table 3-27 for the class of analytes specified. In general, compounds detected at the Himco Dump site are widespread. The only area of concentrated values for any class of analytes is the area covered by suspected soil samples WS-13, WS-15 and WS-16, where high levels of PNAs were detected. This area is along the southern boundary of the Himco Dump site.

General observations regarding distribution of each class of analytes are provided as follows:

Volatile Organics

Volatile organics were detected most frequently in groundwater samples. A total of 17 different volatiles were detected in groundwater. Suspected soil samples included eight different volatiles. Residential wells, sediment and subsurface soil samples detected 7 different volatiles each, however, the number of sampling locations detecting an individual volatile is greatest in

TABLE 3-25

Table 1 - Comparison of OSHA Permissible Exposure Limit Taken From 29CFR 1910 and Maximum Sampled Waste Mass Gas, Himco Dump Site

Chemical	Highest Sampled Concentrations (ng/L)	Highest Sampled Concentrations (PPM)	TWA[a] Final Rule 12/31/92 (PPM)	PEL[b] Transitional Rule (PPM)
Chloromethane	1100	0.53	None	None
Vinyl Chloride	8600	3.37	1	5[d]
Methylene Chloride	80	0.04	500	500
Acetone	26	0.01	750	1000
Carbon Disulfide	300	0.10	4	20
1,1-Dichloroethene	150	0.04	100	100
1,2-Dichloroethene	1300	0.28	200	200
1,1,1-Trichloroethane	300	0.04	350	350
Trichloroethene	370	0.08	50	100
Benzene	140	0.04	10[c]	10[c]
Tetrachloroethene	1400	0.10	25	200
Ethyl Benzene	700	0.16	100	100
Styrene	10	0.002	50	100
Xylenes	1300	0.30	100	100

a - Time Weighted Average over 8 hours
b - Permissible Exposure Limit
c - Proposed is 0.1 PPM
d - 5 ppm limit over 15 minutes

TABLE 3-26

EXCEEDANCES OF OSHA PERMISSIBLE EXPOSURE LIMITS

TAKEN FROM 29 CFR 1910

FOR SOIL GAS SAMPLES

COLLECTED AT HIMCO DUMP

CHEMICAL	PEL TRANSITIONAL RULE (ppm)	TWA FINAL RULE 12/31/92 (ppm)	TT-10 (ppm)	TT-05 (ppm)
VINYL CHLORIDE	5	1	3.37	1.57

TABLE 3-27

SUMMARY OF CRITERIA USED IN ASSESSING POTENTIAL IMPACT OF THE HIMCO DUMP SITE

VOLATILES	SEMIVOLATILES	INORGANICS
Acetone > 530 mg/L	Phenol > 10 mg/L	Soils
Methylene Chloride > 170 mg/L	Sulfur > 30 mg/L	Greater than U.S. soil concentration (Dragun) or if sample was great enough to give TCLP characteristic level (assuming 100% extraction).
Ethyl benzene > 5 mg/L	Bis(2-ethylhexyl) phthalate > 90 mg/L	
Xylene > 20 mg/L		
Hexane > 25 mg/L		
Trichlorethane > 350 mg/L		Water
Isopropyl Alcohol > 400 mg/L		Exceedance of MCL, SMCL, or AWQC.

A/P/HIMCO/AI5

the subsurface soil samples. Volatiles were least often detected in surface soil samples. Detected concentrations of volatiles is greatest in subsurface soil samples followed by groundwater. Volatiles were detected in subsurface soil samples at depths as low as the 14 to 16-foot interval, but were most often detected in the 4 to 6-foot interval. For many of the volatiles detected, the concentration increased with depth. This is true for toluene, methylene chloride, acetone, 1,1,1-trichloroethane and 1,1-dichloroethane.

Semivolatile Organics

Semivolatile organics were detected most often in the suspected wetland soil samples. The number of different volatiles detected was also greatest in suspected wetland soil samples. It is suspected that the source of semivolatiles (mostly PNAs) in this media is construction debris noted in the area of sample locations WS-13, WS-15 and WS-16. The highest number of semivolatiles detected in other media was four. The semivolatiles detected in surface soil were typically also found in subsurface soil samples. The exceptions are benzoic acid which was detected in surface soil but not subsurface soil, and diethylphthalate which was detected in subsurface soil but not surface soil. Two other semivolatiles were unique to groundwater. These were di-n-octylphthalate and dimethylphthalate, both detected in the range of 2-8 ug/L. Semivolatiles were not detected at all in surface water samples. Bis(2-ethylhexyl)phthalate, a known plasticizer, was the most common semivolatile detected among all media sampled. It was the only semivolatile detected in residential wells. The vertical distribution of semivolatiles included detections in the 14 to 16-foot interval of subsurface soil. Semivolatiles were most frequently detected in subsurface soil in the 4 to 6-foot interval. Generally, concentrations in subsurface soil increased with decreasing depth.

Inorganics

Inorganics were detected in subsurface soil as low as the 10 to 12-foot interval. There was no apparent correlation of concentration with depth. For the majority of inorganics detected in any media, the concentrations fluctuated with depth. Inorganic concentrations were generally small, with the exception of aluminum, calcium, iron, magnesium, potassium and sodium. For these compounds, the concentrations detected were greatest in groundwater, with the exception of calcium. Calcium concentrations are greatest near the soil surface, followed by concentrations in groundwater.

PCB/Pesticides

Pesticides were detected in two of the media sampled, suspected wetland soil and sediment. The samples locations where these pesticides were detected were not near each other; therefore the presence in one medium is not considered to be the source in other medium. No indication of source can be gathered from the data.

4.0 WORK PLAN RATIONALE AND APPROACH

Section 4.2.4 provides rationale for the proposed Phase II investigation.

4.2.4 PROPOSED PHASE II RI RATIONALE AND APPROACH

Following the review of Phase I RI sampling results, additional data were identified which are necessary to complete the baseline human health and environmental risk assessment and the feasibility study. The Phase II tasks, the rationale and approach for completing them, are discussed below.

4.2.4.1 Private Well Inventory

Phase I groundwater sampling and analyses detected contaminants at values which may not be high enough to be of concern from a risk assessment standpoint, however, several contaminants exceeded established MCLs. Contaminants were found in downgradient wells screened from 15 to 175 feet but very near the landfill, yet vertical downward gradients are near nonexistent. It is hypothesized that the pumping of private wells in the area has a significant effect on the groundwater flow near the site. Because of the potential influence of pumping wells on the groundwater flow pattern, an assessment of the screened depths and lengths, and pumping rates of all private wells in the vicinity of the site will be performed.

4.2.4.2 Surface Water and Sediment

Two sample locations at the "L" shaped pit, one at the small pond and three at the quarry pond will be sampled for surface water and sediment. Samples will be collected from deeper water near the pond centers. A temperature probe will be lowered to the bottom to develop a temperature profile of each pond. A dredge sampler will be used for gathering sediment for analysis and benthic organisms. A gravity core device will be used to collect a sediment profile of the lake bottom and to provide sediment for geotechnical analysis. Surface water will be collected for analysis at the same locations as sediment samples.

4.2.4.3 Wetland Delineation

During Phase I RI activities a wetland assessment and identification was performed. A wetland delineation is necessary to define the exact boundaries of the wetland for permitting purposes, in the event of remediation. The permits of concern would include the Cops of Engineers Permit 104B. In addition, the size of the wetland is important because categorical exclusions may be granted based on the actual size of the wetland.

This area will be delineated using the "Routine On-site Investigation" procedures outlined in the Federal Manual for Identifying and Delineating Jurisdictional Wetlands, January 1989 (or the latest revision to this manual as it becomes available). This method uses hydric soils, wetland hydrology, and hydrophytic vegetation to delineate wetlands. Results of the delineation will be used to meet federal and state requirements.

4.2.4.4 Wetland and Other Surface Soil Sampling

A preliminary wetlands identification was performed during Phase I activities. Wetlands were identified only at the area south of the quarry pond. In Phase II, delineation will include a refined wetland boundary determination for this area, and the collection of soil samples for chemical analysis.

A surface water drainage study performed by Donohue showed that one of the major directions of surface water drainage is west off of the landfill. In order to investigate the potential impact to surface soils from surface water draining off of the landfill towards the ponds, additional surface soil samples for chemical analysis will be collected west of the landfill cap between the landfill and ponds. These samples will be collected to evaluate the effect of surface drainage from subbasin D to off-site areas to the west.

A dirt bike and foot trail has been developed by trespassers along the south quarry pond fence. Three surface soil samples will be collected along this path to investigate potential contamination which could affect the trail users.

4.2.4.5 Trenching for Leachate Sampling and Debris Delineation

During collection of Phase I contaminated groundwater (leachate) was observed draining from pockets of waste debris within the calcium sulfate matrix. Samples of this leachate will be collected by re-excavating previous trench locations and dipping a sample collection jar into the leachate that collects in the bottom of the trench. The leachate samples will be analyzed to provide data to be used for assessing remedial alternatives and to provide data to the Publicly Operated Treatment Works (POTW) for pretreatment assessment.

In addition, up to 10 trenches will be excavated to delineate the thickness and lateral extent of construction debris associated with high PNA values detected in soil samples taken during Phase I suspected wetland soil sampling.

4.2.4.6 Landfill Cap Soil Sampling for Geotechnical Analysis

A site visit will be conducted by a geotechnical engineer to observe and investigate conditions critical to the placement of a new landfill cap or other types of structures such as buildings or roadways. The typical site features that will be targeted during the site visit include:

- Type and variety of surface soils;
- Surface topography, drainage patterns and erosion channels;

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- Type and variety of surface soils;
- Surface topography, drainage patterns and erosion channels;

5.0 REMEDIAL INVESTIGATION/FEASIBILITY STUDY TASKS

The Remedial Investigation/Feasibility Study tasks are described in detail in the Himco Dump RI/FS Final Work Plan (Donohue, 1990). Please refer to Section 5 of the previously approved work plan.

6.0 COSTS AND KEY ASSUMPTIONS

The costs and key assumptions are provided in detail in the Himco Dump RI/FS Final Work Plan (Donohue, 1990). Please refer to Section 6 of the previously approved work plan.

7.0 SCHEDULE

The schedule for the Himco Dump RI/FS is provided in full in Appendix D-1 of this Addendum to the Himco Dump RI/FS Work Plan. Please refer to Section 7 of the previously approved work plan.

8.0 PROJECT MANAGEMENT

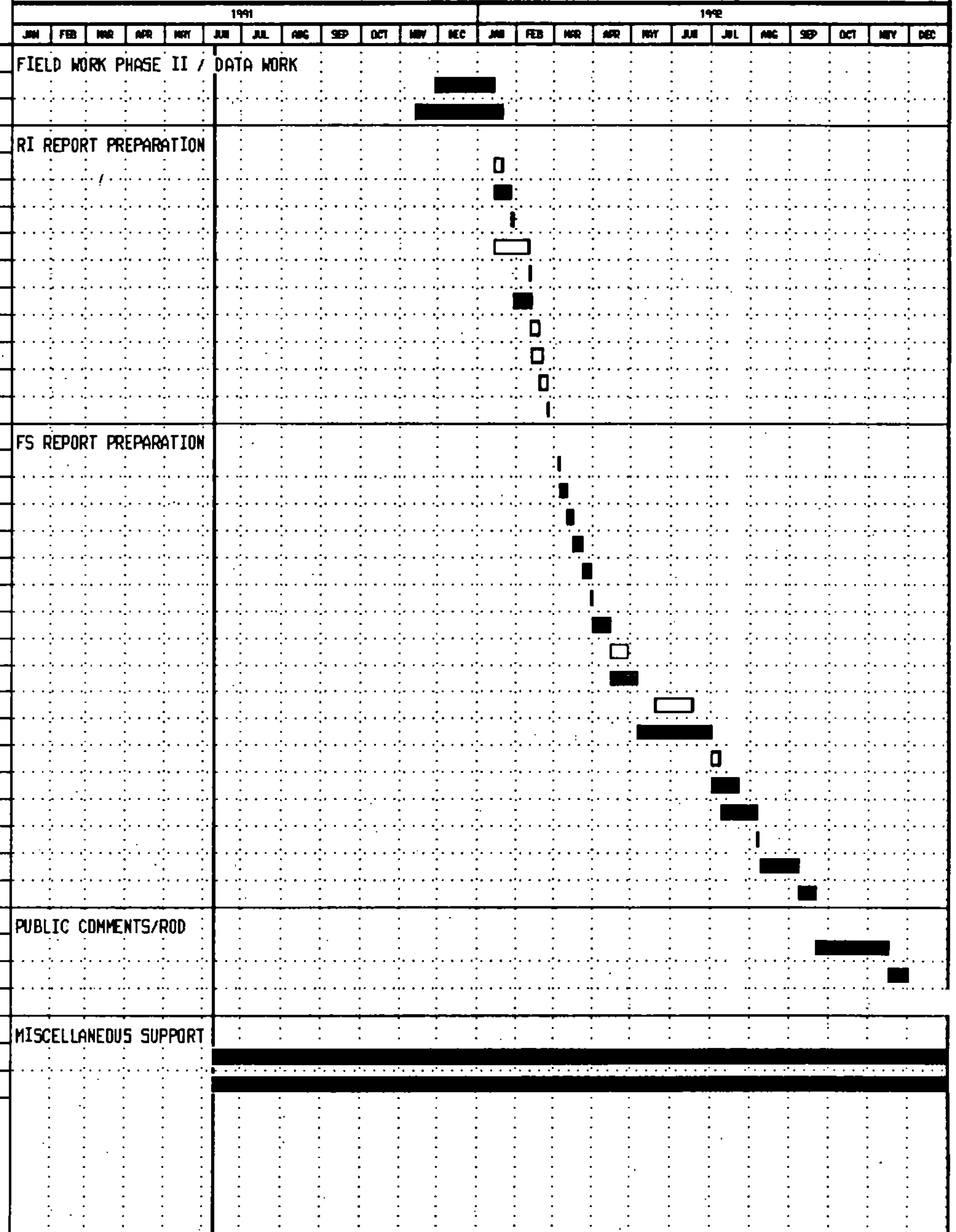
Complete details of the project management activities involved in the Himco Dump RI/FS are described in the Himco Dump RI/FS Final Work Plan (Donohue, 1990). Please refer to Section 8 of the previously approved work plan.

A/P/HIMCO/AH4

APPENDIX D-1

SCHEDULE OF ACTIVITIES

ACTIVITY ID	ACTIVITY DESCRIPTION	ORIG DUR	TOTL FLT	EARLY START	EARLY FINISH
	FIELD WORK PHASE II / DATA WORK				
530	FINAL HUMAN & ENVIRONMENTAL RISK ASSESSMENT	30	0	29NOV91	13JAN92
540	EVALUATE DATA PHASE I & II	45	0	14NOV91	20JAN92
	RI REPORT PREPARATION				
550	IDENTIFY ARARS	5	7	14JAN92	20JAN92
560	LIFE SYSTEMS DETERMINE CLEANUP GOALS	10	0	14JAN92	27JAN92
570	VERIFY VOLUME/AREAS OF CONTAMINATED MEDIA	2	0	28JAN92	29JAN92
580	DRAFT RI REPORT	20	145	14JAN92	10FEB92
590	SUBMIT DRAFT RI REPORT	1	145	11FEB92	11FEB92
600	IDENT & SCREEN REMEDIAL TECH & PROC OPTIONS	10	0	30JAN92	12FEB92
610	EPA COMMENT MEETING	5	145	12FEB92	18FEB92
620	PREPARE AAD DRAFT	7	21	13FEB92	21FEB92
630	REVISE RI REPORT	5	145	19FEB92	25FEB92
640	SUBMIT FINAL RI REPORT	1	145	26FEB92	26FEB92
	FS REPORT PREPARATION				
650	FS TEAM TECH REVIEW MEETING	1	0	5MAR92	5MAR92
660	ASSEMBLE & SCREEN ALTS ON COST IMPLEM & EFFECT.	4	0	6MAR92	11MAR92
670	DEFINE EMISSIONS	3	0	12MAR92	16MAR92
680	LIFE SYSTEMS QUICK SCREENING OF ALTERNATIVES	5	0	17MAR92	23MAR92
690	COMPLETE DRAFT OF AAD	5	0	24MAR92	30MAR92
700	SUBMIT DRAFT AAD TO EPA	1	0	31MAR92	31MAR92
720	EPA REVIEW OF DRAFT AAD	10	0	1APR92	14APR92
721	PREPARE FINAL AAD & SUBMIT TO EPA	10	5	15APR92	28APR92
730	POST SCREENING TASKS (ARARS)& TREAT STUDIES	15	0	15APR92	5MAY92
740	L.S. RISK EVALUATION OF ALTERNATIVES	20	10	20MAY92	17JUN92
750	DETAILED ANALYSIS OF ALTERNATIVES	40	0	6MAY92	1JUL92
760	DECISION ANALYSIS (SENSITIVITY ANALYSIS)	4	11	2JUL92	8JUL92
770	COMPARATIVE EVALUATION OF ACCEPTABLE ALTERNATIVE	15	0	2JUL92	23JUL92
780	DRAFT F.S. REPORT	20	0	10JUL92	6AUG92
790	SUBMIT DRAFT F.S. REPORT TO EPA	1	0	7AUG92	7AUG92
800	AGENCY REVIEW OF DRAFT F.S. REPORT	20	0	10AUG92	7SEP92
810	PREPARE PUBLIC COMMENT DRAFT FS	10	0	8SEP92	21SEP92
	PUBLIC COMMENTS/ROD				
820	PUBLIC COMMENT PERIOD	40	0	22SEP92	16NOV92
830	RESPOND TO PUBLIC COMMENTS	10	0	17NOV92	1DEC92
840	PREPARATION OF ROD	21	0	2DEC92	31DEC92
	MISCELLANEOUS SUPPORT				
900	PRP SUPPORT	399	0	10JUN91	31DEC92
910	ADMINISTRATIVE RECORD	399	0	10JUN91	31DEC92



Activity Bar/Early Dates
Critical Activity
Progress Bar

Primavera Systems, Inc. 1984-1991

Project Start : 25SEP89
Project Finish: 31DEC92

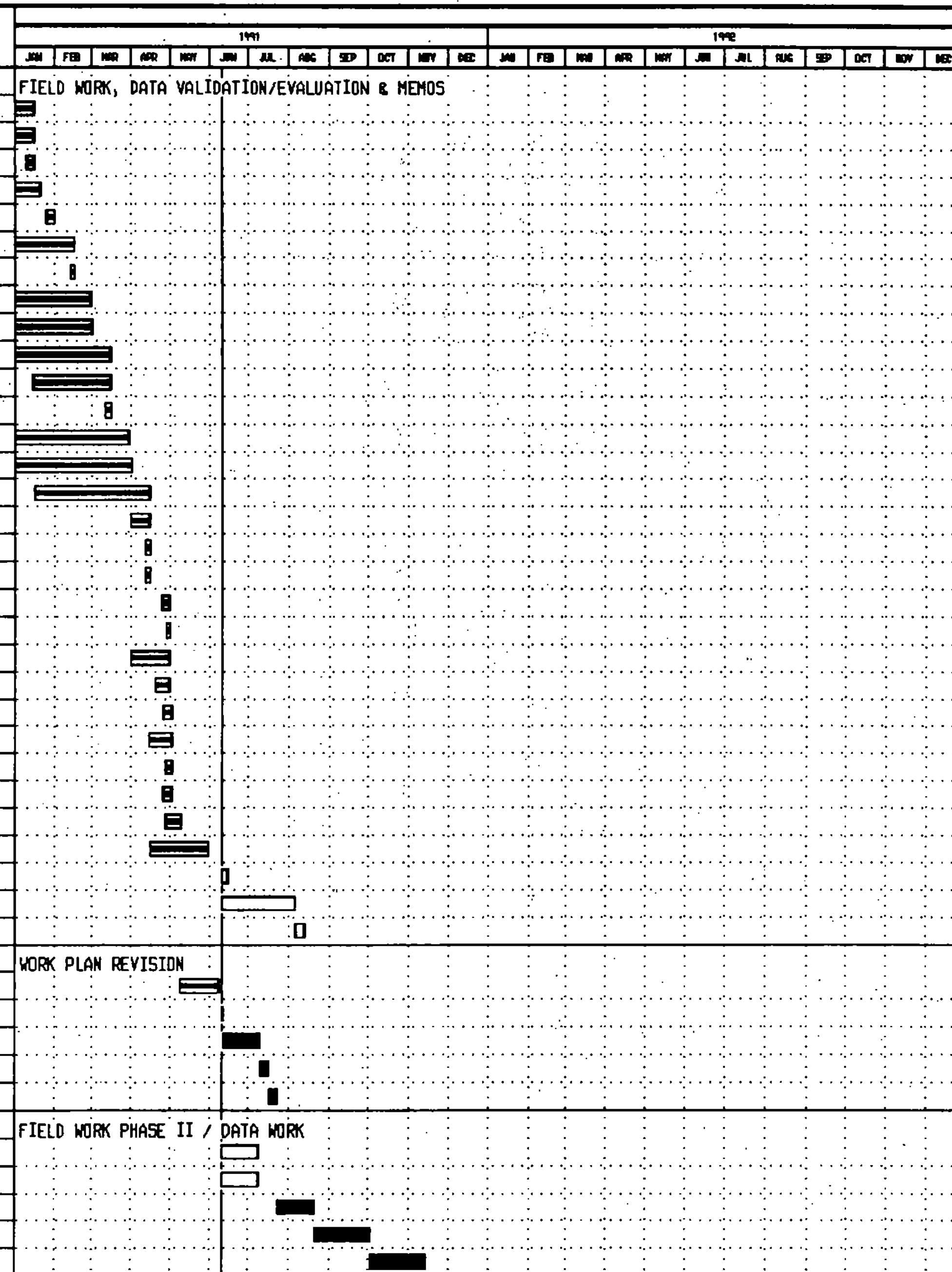
DONOHUE & ASSOCIATES, INC. - 20026
WA 17-5L4J HIMCO DUMP RI/FS
WORK PLAN REVISION 1 - SCHEDULE

Sheet 2 of 2

Data Date: 10JUN91
Plot Date: 30MAY91

086C REVISED SCHEDULE - 6/10/91			
Date	Revision	Checked	Approved

ACTIVITY ID	ACTIVITY DESCRIPTION	ORIG DUR	TOTL FLT	EARLY START	EARLY FINISH
	FIELD WORK, DATA VALIDATION/EVALUATION & MEMOS				
100	DRILL BORINGS/CORES - INSTALL WELLS	22		23OCT90A	15JAN91A
110	PURGE COLLECT PACKAGE & SHIP GW SAMPLES	4		19DEC90A	15JAN91A
120	FIELD MEMO - GW SAMPLING	5		10JAN91A	15JAN91A
130	COLLECT, PACKAGE & SHIP SOIL SAMPLES	1		29OCT90A	20JAN91A
140	COLLECT PKG & SHIP GEOTECH SAMPLES	2		25JAN91A	31JAN91A
150	DATA REDUCTION & INTERPRETATION - EM-31 SURVEY	1		8NOV90A	15FEB91A
160	FIELD TECH MEMO - EM-31 SURVEY	2		13FEB91A	15FEB91A
170	CLP COORDINATION	1		23OCT90A	28FEB91A
180	LAB ANALYSIS/DATA VALIDATION - PRIVATE WELL SAMP	60		30NOV90A	1MAR91A
190	LAB ANALYSIS/DATA EVALUATION - SOIL SAMPLES	60		3DEC90A	15MAR91A
200	LAB ANALYSIS/DATA VALIDATION -USGS WELL	60		15JAN91A	15MAR91A
210	FIELD MEMO - USGS WELL SAMPLING	2		12MAR91A	15MAR91A
220	DEMOBILIZE	1		5DEC90A	30MAR91A
230	LAB ANALYSIS/DATA VALIDATION - SW/SEDIMENT	60		30NOV90A	1APR91A
240	LAB ANALYSIS/DATA VALIDATION - GW	40		16JAN91A	15APR91A
250	FIELD MEMO - STAFF GAUGES	5		1APR91A	15APR91A
260	FIELD MEMO - SW/SEDIMENT	2		12APR91A	15APR91A
270	FIELD MEMO - PRIVATE WELL SAMPLES	2		12APR91A	15APR91A
280	FIELD MEMO - WELL INVENTORY USGS WELLS	5		25APR91A	30APR91A
290	FIELD MEMO - SOIL SAMPLES	2		29APR91A	30APR91A
300	REPORT/TECH MEMO - SW/SEDIMENT	10		1APR91A	30APR91A
310	REPORT/TECH MEMO - USGS WELL SAMPLING	10		20APR91A	30APR91A
320	WASTE MASS GAS FIELD MEMO	5		26APR91A	2MAY91A
330	REPORT/TECH MEMO - PRIVATE WELL SAMPLES	10		15APR91A	2MAY91A
340	FIELD TECH MEMO - WETLANDS SURVEY/SAMPLING	2		28APR91A	2MAY91A
350	ADDRESS AIR PATHWAY ANALYSES	5		26APR91A	2MAY91A
360	PRELIMINARY RISK ASSESSMENT	40		28APR91A	9MAY91A
370	PRELIMINARY DATA EVALUATION PHASE I	10		16APR91A	30MAY91A
410	EVALUATE SLUG TEST DATA	5	106	10JUN91	14JUN91
480	LAB ANALYSIS/DATA VALIDATION - GEOTECH	40	66	10JUN91	5AUG91
490	EVALUATE DATA - GEOTECH	5	66	6AUG91	12AUG91
	WORK PLAN REVISION				
380	PREPARE PHASE II WORK PLAN	20		9MAY91A	7JUN91A
400	SUBMIT PHASE II WORK PLAN TO EPA	1	0	10JUN91	10JUN91
440	EPA REVIEW PHASE II WORK PLAN	20	0	11JUN91	9JUL91
450	REVISE PHASE II WORK PLAN	5	0	10JUL91	16JUL91
470	EPA APPROVE PHASE II WORK PLAN	5	0	17JUL91	23JUL91
	FIELD WORK PHASE II / DATA WORK				
420	PREFIELD PHASE II MOBILIZATION	20	11	10JUN91	8JUL91
430	SUBCONTRACT PROCUREMENT	20	11	10JUN91	8JUL91
501	PHASE II FIELD OPERATION	20	0	24JUL91	20AUG91
510	LABORATORY ANALYSIS	30	0	21AUG91	2OCT91
520	DATA VALIDATION	30	0	3OCT91	13NOV91



Activity Bar/Early Dates
Critical Activity
Progress Bar

Primavera Systems, Inc. 1984-1991

Project Start : 25SEP89
Project Finish: 31DEC92

DONOHUE & ASSOCIATES, INC. - 20026
WA 17-5L4J HIMCO DUMP RI/FS
WORK PLAN REVISION 1 - SCHEDULE

Sheet 1 of 2

Data Date: 10JUN91
Plot Date: 30MAY91

OBSC REVISED SCHEDULE - 6/10/91

Date	Revision	Checked	Approved